

PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Maternal Depression and Violence Exposure: Double Jeopardy for Child School Functioning

Michael Silverstein, Marilyn Augustyn, Howard Cabral and Barry Zuckerman
Pediatrics 2006;118;792-800
DOI: 10.1542/peds.2005-1841

This information is current as of December 7, 2006

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://www.pediatrics.org/cgi/content/full/118/3/e792>

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2006 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



Maternal Depression and Violence Exposure: Double Jeopardy for Child School Functioning

Michael Silverstein, MD, MPH^a, Marilyn Augustyn, MD^a, Howard Cabral, PhD, MPH^b, Barry Zuckerman, MD^a

^aDepartment of Pediatrics, Boston University School of Medicine, Boston Medical Center, Boston, Massachusetts; ^bDepartment of Biostatistics, Boston University School of Public Health, Boston, Massachusetts

The authors have indicated they have no financial relationships relevant to this article to disclose.

ABSTRACT

OBJECTIVE. The goal was to determine how violence exposure affects the relationship between maternal depression, cognitive ability, and child behavior.

METHODS. A multivariate regression analysis of data for a nationally representative sample of kindergarten students was performed. Maternal depression and violence exposure were measured with standardized parent interviews. Standardized *T* scores were derived from direct testing of children in reading, mathematics, and general knowledge; child behavior was reported by teachers.

RESULTS. A total of 9360 children had neither maternal depression nor violence exposure, 779 violence only, 1564 depression only, and 380 both. Maternal depression alone was associated with poorer mean *T* scores for reading, mathematics, and general knowledge. However, this effect was attenuated by nearly 25% for reading and general knowledge with adjustment for violence. Children with concurrent exposure to depression and violence had lower mean *T* scores for reading, mathematics, and general knowledge, as well as more-concerning behaviors, than did those exposed to either factor alone. Across all outcome measures, boys seemed more affected than girls.

CONCLUSIONS. Violence compounds the effect of maternal depression on school functioning and behavior. Research and intervention planning for children affected by maternal depression should consider violence exposure.

www.pediatrics.org/cgi/doi/10.1542/peds.2005-1841

doi:10.1542/peds.2005-1841

Key Words

maternal depression, violence, school readiness, child development

Abbreviations

ECLS-K—Early Childhood Longitudinal Survey, Kindergarten Cohort
CES-D—Center for Epidemiologic Studies Depression Scale
OR—odds ratio
aOR—adjusted odds ratio
CI—confidence interval

Accepted for publication Apr 10, 2006

Address correspondence to Michael Silverstein, MD, MPH, Boston Medical Center, Maternity Building, 4th Floor, 91 East Concord St, Boston, MA 02118. E-mail: michael.silverstein@bmc.org

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275). Copyright © 2006 by the American Academy of Pediatrics

THE NEGATIVE IMPACT of maternal depression on children has been well documented. Children of depressed mothers suffer a variety of developmental, behavioral, and mental health problems, compared with children whose mothers are not depressed.¹⁻⁴ Evidence also suggests that children who witness violence or whose mothers are victimized by violence have problems with social competence, temperament, internalizing behavior, and aggression.⁵⁻⁷ Clinical experience supports these early studies.^{8,9}

The 2 categories of violence exposure that have been studied most comprehensively, namely, intimate partner violence and community violence, have both been associated with high rates of trauma symptoms.¹⁰ Between 62% and 81% of female domestic violence victims meet criteria for posttraumatic stress disorder^{11,12} and, although the effect of community violence is less well understood, it is estimated that nearly one third of individuals exposed to community violence exhibit trauma symptoms.¹³ Depression and trauma symptoms coexist frequently,¹⁴⁻¹⁹ and depression accompanied by trauma symptoms has been found to be more complicated, less remitting, and less responsive to treatment than depression alone.²⁰⁻²² There is also evidence that depression in the presence of trauma has distinct symptoms, compared with depression in the absence of trauma,²³⁻²⁷ and may even be different at the biochemical level.²⁸

Because of the modulating influence of trauma on depression and because domestic violence and community violence so often lead to trauma symptoms, it is reasonable to postulate that maternal depression accompanied by these types of violence may be more harmful to children than depression occurring alone. To date, however, studies of maternal depression have not considered the consequences of concurrent violence exposure on child outcomes; coincidentally, many interventions aimed at ameliorating the negative effects of maternal depression on children have failed to demonstrate significant effects.²⁹ Filling this knowledge gap is important not only to ensure that the negative impact of violence is not misattributed to maternal depression but also to maximize the effectiveness of future interventions for maternal depression.

The aim of this investigation was to determine the impact of violence exposure on the relationship between maternal depression and childhood cognitive performance and behavior. We hypothesized that controlling for violence as a potentially confounding phenomenon would lessen substantially the magnitude of association between maternal depression and these outcomes and that the cooccurrence of violence and maternal depression in the same family would be associated with poorer cognitive functioning and behavior, beyond the main effect of either exposure alone.

METHODS

Data Source and Study Sample

We extracted data from the base year of the Early Childhood Longitudinal Survey, Kindergarten Cohort (ECLS-K). The ECLS-K draws from a nationally representative sample of children who attended kindergarten in 1998 to 1999 and monitors these children through the fifth grade with regular face-to-face parent interviews, teacher surveys, and direct cognitive assessments.³⁰ Because of the many reasons why children cease to be cared for by their biological parents (and the possible cooccurrence of depressive symptoms and violence with these reasons), we restricted our study to biological mother-child dyads for which the mother served as the primary survey respondent.

Maternal Depression and Violence Exposure

Respondent mothers answered a 12-item version of the Center for Epidemiologic Studies Depression Scale (CES-D), a valid reliable measure of depressive symptoms.³¹ Following convention, we combined responses to individual CES-D items to create a raw symptom score. The National Center for Education Statistics categorizes this raw score as no, mild, moderate, or severe depressive symptoms,³² and we considered only those with moderate/severe symptoms (raw scores of >9) to be depressed. We chose this cutoff point because it corresponds to the most commonly used clinical cutoff point (raw score of >15) for the full CES-D and because the proportion of mothers considered to have clinically significant depressive symptoms with this measure (19%) was consistent with previously published estimates for mothers with young children.³³⁻³⁵ We determined the cutoff point for the dichotomous measure before exploratory data analyses.

Exposure to violence was defined by using 2 ECLS-K survey items. First, respondents were asked, "When you have a serious disagreement with your partner, how often do you end up hitting or throwing things at each other?" We considered any response other than "never" to represent in-home violence. Second, respondents were asked how much of a problem violent crime is in their neighborhood. We considered any response other than "no problem" to represent community violence. We developed a composite violence exposure variable that represented a combination of in-home and community violence. If the family was affected by either type of violence and data on the other type were missing, then we considered the composite variable positive. If data on both in-home violence and community violence were missing, then the composite variable was coded as missing.

Each mother-child dyad was assigned to 1 of 4 mutually exclusive exposure categories, namely, neither maternal depression nor violence, violence only, depres-

sive symptoms only, or both depressive symptoms and violence. Dyads for which data on either depression or violence were missing were excluded from analyses involving both exposures.

Child and Family Characteristics

We extracted the child's age and gender, the mother's age, and the number of other siblings in the home. In addition, socioeconomic status was quantified with a continuous measure constructed by the National Center for Education Statistics to represent parental education, income, and social prestige of parental occupations. Child race was classified as white, black, Hispanic, Asian/Pacific Islander, or other.

Outcome Measures

We divided our outcome measures into 2 categories, namely, school functioning and child behavior. To measure school functioning, we extracted standardized *T* scores (population mean: 50; SD: 10) for directly administered tests in reading, mathematics, and general knowledge. *T* scores provide normative value-referenced measurements of achievement, that is, estimates of achievement level relative to the population as a whole. Because the ECLS cohort is nationally representative, the *T* scores provide an indicator of the extent to which an individual or a subgroup ranks higher or lower than the national average. Reading assessments measured basic skills, vocabulary, and comprehension; mathematics assessments measured knowledge and problem-solving; and general knowledge assessments measured conceptual knowledge of science and social studies.

We assessed child behavior through teachers' responses to the Social Rating Scale, an adaptation of the valid reliable Social Skills Rating System,³⁶ which characterizes child behavior with a variety of thematic subscales. Teachers were chosen for this role by a school-based coordinator, who interacted directly with personnel from the National Center for Education Statistics. For this study, we assessed 2 positive child behavior sets (self-control and interpersonal skills) and 2 negative sets (externalizing behavior and internalizing behavior). Within the ECLS-K cohort, teacher responses to Social Rating Scale subscales demonstrated high split-half reliabilities between 0.79 and 0.90.³⁷ For each subscale, children were scored between 1 and 4, with higher numbers indicating a greater tendency to demonstrate the behavior. To make our results more clinically relevant and to follow the precedent of previous studies,³⁸ we dichotomized responses at either the 5th percentile (self-control and interpersonal skills) or the 95th percentile (internalizing behavior and externalizing behavior). To corroborate these findings, we also analyzed these behavior outcomes as continuous variables.

Data Analyses

We used individual-level weights from ECLS-K to yield valid national estimates. With weighted data, we used the χ^2 test to study associations for categorical outcome data and the *t* test for continuous data. With weighted cross-sectional data, we used multivariate logistic regression to estimate odds ratios (ORs) and linear regression to model differences in interval data. We used the Taylor series estimation to accommodate the complex sampling design of the ECLS-K.

Variables were selected for inclusion in the models because of their documented or theoretical relevance to the outcomes of interest. Our base multivariate models were adjusted for mother's age, child's age and gender, number of siblings in the home, and family socioeconomic status.

Using the techniques described above, we constructed a series of multivariate analyses. First, to confirm the comparability of our data with previous studies, we tested the association between maternal depression and our outcomes, adjusting for the potential confounders listed above. Second, to test the hypothesis that controlling for violence would decrease the measured association between maternal depression and our outcome measures, we also adjusted these models for violence exposure.

To test the hypothesis that violence exposure augments the adverse effects of maternal depression, we disaggregated maternal depression and violence, deriving regression coefficients for depression and violence independently as well as together, a technique that yields regression coefficients identical to those obtained with the use of an interaction term. We assessed formally effect modification by violence exposure by adding depression-violence interaction terms to the base regression models. Because of evidence indicating that boys and girls are affected differently by violence exposure,³⁹ we stratified our analyses according to child gender and assessed formally the effect modification by child gender by adding 3-way (depression-violence-gender) interaction terms to the models. Lastly, because of recommendations regarding the role of race in epidemiologic studies,^{40–42} we stratified all analyses according to race. Because we considered the analysis according to race exploratory, and because of sample size limitations, we did not perform a formal assessment of effect modification by race. We performed each of these analyses by using the aforementioned composite violence measure, as well as by using the in-home violence and community violence measures separately.

We performed all analyses with Stata 8.0 software (College Station, TX). Because the ECLS-K is a public-use data set devoid of unique identifiers, the Boston University Medical Center granted official exemption from institutional board review.

RESULTS

Maternal Depression and Violence Exposure

Among the 21 260 kindergarten students included in the ECLS-K cohort, 15 386 biological mother-child dyads were eligible for our study (348 dyads were excluded because the mother was not the biological mother). Among the eligible dyads, 2806 (19%) of 15 227 mothers had CES-D scores indicating moderate to severe depressive symptoms; 145 mothers (1%) had missing CES-D scores. A total of 675 (6%) of 11 910 mothers reported that domestic disagreements involved hitting or throwing things, and 540 (4%) of 15 341 reported neighborhood violent crime. Data on in-home violence were missing in 22% of cases, but in the vast majority of these cases (21%), data were missing because of nonapplicability of the question (most commonly, the mother did not have a partner), as opposed to nonresponse. Data on community violence were missing in 0.2% of cases. Because of overlap between in-home violence and community violence, a total of 1166 (10%) of 12 123 mother-child dyads were considered exposed to violence. All estimates were consistent with previously published data.^{43–45}

A total of 12 083 dyads were assigned to 1 of 4 mutually exclusive exposure categories, 9360 (77%) to neither depression nor violence, 779 (7%) to violence alone, 1564 (13%) to depression alone, and 380 (3%) to both. Depressive symptoms were more than twice as common among mothers exposed to violence, compared with mothers not exposed (33% vs 15%; $P < .0001$). However, among mothers with moderate/severe depressive symptoms, there was no clinically significant difference in raw CES-D scores between those exposed and not exposed to violence (15.5 vs 14.2).

Sample Description According to Exposure Group

Overall, 51% of our cohort was male, the mean child age was 75 months (SD: 4 months), the mean maternal age was 32.8 years (SD: 5.9 years), and the mean number of siblings in the home was 1.5 (SD: 1.1). Across exposure groups, there was no significant difference in child age or ratio of girls to boys. However, maternal age and family socioeconomic status decreased, whereas the mean number of siblings increased, among those exposed to violence and/or affected by maternal depression. Mean T scores in reading, mathematics, and general knowledge were lower and the prevalence of concerning child behaviors was greater among those with depression and violence exposure (Table 1).

Effects of Maternal Depression on School Functioning and Child Behavior

We first tested the association between maternal depression and our outcomes by intentionally not adjusting for violence exposure. In these multivariate models, maternal depression was associated with decreases in mean T scores for reading (-2.11 ; 95% confidence interval [CI]: -3.06 to -1.17), mathematics (-1.45 ; 95% CI: -1.94 to -0.95), and general knowledge (-2.04 ; 95% CI: -2.75 to -0.132) (Table 2). Regarding child behaviors, maternal depression alone had a statistically significant association only with interpersonal skills (adjusted OR [aOR]: 0.66; 95% CI: 0.46–0.93); its relationship to self-control (aOR: 0.71; 95% CI: 0.48–1.06), externalizing behavior (aOR: 1.56; 95% CI: 0.97–2.51), and internalizing behavior (aOR: 1.47; 95% CI: 0.86–2.50) did not reach statistical significance.

With additional adjustment of the models for violence exposure (Table 2), the effect of maternal depression on reading scores was attenuated by 24% and the effect on

TABLE 1 Sociodemographic Characteristics, School Functioning, and Child Behavior According to Exposure Group

	Total (<i>n</i> = 12 083)	No Depression or Violence (<i>n</i> = 9360)	Violence (<i>n</i> = 779)	Depression (<i>n</i> = 1564)	Depression and Violence (<i>n</i> = 380)
Population estimate, weighted <i>n</i>	2 636 455	2 018 206	176 642	352 757	87 266
Family characteristics					
Child's age, mean \pm SD, mo	75 \pm 4	75 \pm 4	74 \pm 5	75 \pm 5	74 \pm 5
Child male, %	51	50	51	52	51
Mother's age, mean \pm SD, y	32.8 \pm 5.9	34 \pm 6	32 \pm 6	32 \pm 6	31 \pm 6
Family socioeconomic status score, mean \pm SD	0.03 \pm 0.79	0.25 \pm 0.75	-0.17 ± 0.80	-0.07 ± 0.69	-0.39 ± 0.76
No. of siblings in home, mean \pm SD	1.5 \pm 1.1	1.5 \pm 1.1	1.6 \pm 1.2	1.6 \pm 1.2	1.7 \pm 1.3
Outcomes					
School functioning, mean \pm SD, T score					
Reading	51 \pm 10	52.5 \pm 9.4	50.3 \pm 10.2	49.6 \pm 10.2	46.4 \pm 9.9
Mathematics	51 \pm 10	52.7 \pm 9.4	49.6 \pm 10.4	49.8 \pm 9.9	45.6 \pm 10.2
General knowledge	51 \pm 10	53.0 \pm 9.5	49.5 \pm 9.8	49.8 \pm 9.9	45.5 \pm 10.2
Child behaviors, % displaying behavior					
Self-control	93.8	94.6	91.4	92.4	86.9
Interpersonal skills	93.4	94.4	90.1	91.5	84.1
Externalizing behavior	3.4	3.1	5.1	3.6	6.8
Internalizing behavior	3.0	2.7	4.8	3.8	5.7

TABLE 2 Effects of Maternal Depression, With and Without Adjustment for Exposure to Violence, in Weighted Multivariate Analyses

School Functioning	Difference in <i>T</i> Score (95% CI)		Change in Depression's Effect After Adjustment for Violence Exposure, %
	Maternal Depression	Maternal Depression, Adjusted for Violence Exposure	
Reading	−2.11 (−3.06 to −1.17)	−1.61 (−2.09 to −1.13)	−24
Mathematics	−1.45 (−1.94 to −0.95)	−1.33 (−1.81 to −0.85)	−8
General knowledge	−2.04 (−2.75 to −1.32)	−1.53 (−2.06 to −1.02)	−25

Child Behavior	aOR of Displaying Behavior (95% CI)		Change in Depression's Effect After Adjustment for Violence Exposure, %
	Maternal Depression	Maternal Depression, Adjusted for Violence Exposure	
Self-control	0.71 (0.48–1.06)	0.72 (0.58–0.90)	−1
Interpersonal skills	0.66 (0.46–0.93)	0.70 (0.57–0.86)	−6
Externalizing behavior	1.56 (0.97–2.51)	1.08 (0.76–1.54)	−31
Internalizing behavior	1.47 (0.86–2.50)	1.27 (0.92–1.75)	−14

All models were adjusted for maternal age, child age and gender, number of siblings in the home, and socioeconomic status. The socioeconomic status variable represents a composite of family income, parental education, and social prestige of parental occupations. The reference group was children with nondepressed mothers.

general knowledge scores was attenuated by 25%. With additional adjustment for violence exposure, the effect of maternal depression on externalizing behavior decreased in magnitude by 31%.

Violence Exposure Augmentation of the Adverse Effects of Maternal Depression

Among children with dual exposure to maternal depression and violence, decreases in mean *T* scores for reading (−2.99; 95% CI: −3.99 to −1.99), mathematics (−3.23; 95% CI: −4.26 to −2.20), and general knowledge (−3.49; 95% CI: −4.63 to −2.35) were more than double in magnitude, compared with those among children exposed to either factor alone (Table 3). For these cognitive outcomes, depression-violence interaction terms demonstrated *P* values of .06 (reading), .08 (mathematics), and .06 (general knowledge), providing suggestive evidence of effect modification.

Regarding behavior, children with dual exposure had an aOR of 0.42 (95% CI: 0.29–0.60) for self-control, whereas the effects of violence (aOR: 0.65; 95% CI: 0.47–0.89) or maternal depression (aOR: 0.74; 95% CI:

0.57–0.97) alone were less substantial. Children's interpersonal skills, externalizing behavior, and internalizing behavior followed similar patterns. For these behavioral outcomes, however, depression-violence interaction terms did not demonstrate *P* values suggesting effect modification. Analyses of these behavioral outcomes as continuous variables in linear regression models yielded consistent results (data not shown). Although community violence seemed to exert a greater effect on our cognitive measures than did in-home violence, disaggregation of in-home violence and community violence did not change our results substantially (data available on request).

Stratification According to Gender and Race

In all categories of school functioning, the combined effect of depression and violence seemed greater for boys than for girls (Table 4). Boys exposed to both maternal depression and violence experienced an estimated decrease of 4.27 points (95% CI: 2.56–5.98 points) on standardized assessments of general knowledge, compared with those exposed to neither; for this outcome

TABLE 3 Compounded Effects of Maternal Depression and Violence Exposure in Weighted Multivariate Analyses

	Violence Only	Maternal Depression Only	Depression and Violence
School functioning, difference in <i>T</i> score (95% CI)			
Reading	−0.31 (−1.12 to 0.50)	−1.42 (−1.94 to −0.89)	−2.99 (−3.99 to −1.99)
Mathematics	−0.89 (−1.64 to −0.14)	−1.13 (−1.68 to −0.59)	−3.23 (−4.26 to −2.20)
General knowledge	−0.86 (−1.64 to −0.09)	−1.34 (−1.91 to −0.78)	−3.49 (−4.63 to −2.35)
Child behavior, aOR of displaying behavior (95% CI)			
Self-control	0.65 (0.47–0.89)	0.74 (0.57–0.97)	0.42 (0.29–0.60)
Interpersonal skills	0.62 (0.46–0.84)	0.73 (0.57–0.93)	0.37 (0.26–0.52)
Externalizing behavior	1.63 (1.16–2.30)	1.04 (0.70–1.55)	2.01 (1.19–3.40)
Internalizing behavior	1.42 (0.89–2.27)	1.23 (0.86–1.78)	1.98 (1.19–3.29)

All models were adjusted for maternal age, child age and gender, number of siblings in the home, and socioeconomic status. The socioeconomic status variable represents a composite of family income, parental education, and social prestige of parental occupations. The reference group was children exposed to neither maternal depression nor violence.

TABLE 4 Different Effects Among Boys and Girls

	Violence Only	Maternal Depression Only	Depression and Violence
School functioning, difference in <i>T</i> score (95% CI)			
Reading			
Boys	−0.20 (−1.41 to 1.02)	−1.18 (−1.96 to −0.40)	−3.64 (−5.28 to −2.00)
Girls	−0.43 (−1.52 to 0.66)	−1.69 (−2.43 to −0.95)	−2.29 (−3.61 to −0.98)
Mathematics			
Boys	−0.74 (−1.89 to 0.42)	−1.2 (−1.98 to −0.43)	−3.86 (−5.37 to −2.34)
Girls	−1.04 (−2.07 to −0.24)	−1.04 (−1.81 to −0.29)	−2.63 (−4.13 to −1.13)
General knowledge			
Boys	0.04 (−1.13 to 1.20)	−1.47 (−2.18 to −0.77)	−4.27 (−5.98 to −2.56)
Girls	−1.81 (−2.86 to −0.77)	−1.18 (−1.97 to −0.40)	−2.63 (−4.13 to −1.13)
Child behavior, aOR of displaying behavior (95% CI)			
Self-control			
Boys	0.74 (0.48–1.14)	0.77 (0.57–1.06)	0.36 (0.22–0.58)
Girls	0.53 (0.33–0.85)	0.69 (0.43–1.09)	0.57 (0.31–1.04)
Interpersonal skills			
Boys	0.67 (0.45–1.00)	0.75 (0.56–1.00)	0.31 (0.20–0.47)
Girls	0.54 (0.34–0.88)	0.68 (0.44–1.06)	0.53 (0.27–1.03)
Externalizing behavior			
Boys	1.46 (0.93–2.32)	1.08 (0.69–1.69)	2.59 (1.42–4.72)
Girls	1.95 (1.03–3.71)	0.93 (0.47–1.84)	0.80 (0.29–2.22)
Internalizing behavior			
Boys	1.15 (0.61–2.19)	1.24 (0.77–1.98)	3.48 (1.94–6.27)
Girls	1.64 (0.87–3.09)	1.25 (0.74–2.11)	0.61 (0.24–1.59)

All models were adjusted for maternal age, child age and gender, number of siblings in the home, and socioeconomic status. The socioeconomic status variable represents a composite of family income, parental education, and social prestige of parental occupations. The reference group was children exposed to neither maternal depression nor violence.

measure, effect modification by gender was statistically significant ($P = .03$). Regarding behavior, the gender difference was particularly apparent for externalizing and internalizing behaviors, for which boys with dual exposure had aORs of 2.59 (95% CI: 1.42–4.72) and 3.48 (95% CI: 1.94–6.27), respectively. For internalizing behavior, effect modification by gender was statistically significant ($P = .003$). Among the subjects whose mothers were not depressed, violence exposure was associated with statistically significant differences in our outcome measures more often among girls than among boys; however, the clinical significance of these differences did not seem substantial.

Although limited by sample size, trends within races mirrored the overall trends for the cohort as a whole (data not shown). An exception to this was the decrease in cognitive scores among Asian children exposed to both maternal depression and violence, as follows: for reading, a loss of 3.74 points on average (95% CI: 0.73–6.75 points); for mathematics, 5.41 points (95% CI: 2.77–8.05 points); for general knowledge, 5.91 points (95% CI: 3.21–8.60 points).

DISCUSSION

For this nationally representative sample of kindergarten students, we found that maternal depression was associated with decreased cognitive abilities and suboptimal interpersonal skills. When controlling for violence exposure, however, we demonstrated attenuation of the effect of maternal depression on children's abilities in both

reading and general knowledge. When coexistent within the same family, maternal depression and violence were associated with poorer cognitive abilities and more-concerning child behaviors than when each was present individually. For measures of cognitive abilities, we found evidence suggesting an interactive effect.

Our results are consistent with previous reports on the prevalence of maternal depression, domestic violence, and community violence and the effects of adult depression on children. They are also consistent with previous studies on violence that documented modest but consistent associations between family violence exposure and psychological distress in children. However, our study adds to the field in 2 ways. First, it suggests that previous reports might have overestimated the association between maternal depression and child behavior by not controlling for violence exposure. Second, it suggests that maternal depression and violence, when coexistent within the same family, exert a more harmful effect on children than either exposure alone.

Although the mechanism of this effect cannot be determined from the present study, we hypothesize that maternal trauma symptoms are a key mediating factor. Because trauma victims often display diminished responsiveness to the external world (referred to in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*, as “psychic numbing” or “emotional anesthesia”¹⁶), the nuances of a mother's depressive illness that is comorbid with violence exposure or trauma symptoms

may suppress nurturing parent-child interactions more than depression existing on its own.

In the United States presently, increasing attention is being paid to measuring children's school performance. Much of this dialogue has focused on the No Child Left Behind legislation and schools' accountability for their students' performance. Less prominent, however, has been a sustained focus on other family and community factors that influence children's ability to learn. In our study sample, kindergarten boys whose mothers reported both depressive symptoms and exposure to violence scored 7% to 10% lower on standardized tests of mathematics, reading, and general knowledge than did otherwise similar boys, an effect similar in magnitude to that of lead intoxication⁴⁶⁻⁴⁸ or low birth weight.⁴⁹⁻⁵¹ Considering the suboptimal behavior patterns noted, it is reasonable to postulate that maternal depression and violence exposure may account for substantial school difficulties among US children.

Our study was limited by a number of factors, foremost among which were our violence exposure measures. We restricted these measures to the 2 most common types of violence, namely, community violence and intimate partner violence, which we assessed with 2 questions. The psychometric properties of these questions are unknown, however, and we must assume misclassification error. Specifically, the limited range of violent behaviors covered by these measures and the in-home measure's presumption of bidirectional violence both represent a bias in the direction of underreporting and limit the extent to which our results can be generalized to other types of violence. Our measure of violence exposure does have internal validity, however, because its associated outcomes are similar in magnitude to, but independent of, those for maternal depression and because our results are consistent across virtually all outcomes.

Although the effect of maternal depression and violence exposure on child development is worth studying on its own, our theoretical construct invokes trauma symptoms as a key mediating factor in this relationship. However, because we did not have the means to assess trauma symptoms directly, we are unable to comment on the validity of this construct, and it is possible that other mechanisms (for example, children witnessing violence directly) may be responsible for the observed effects.

Our ability to demonstrate a statistically significant interaction between maternal depression and violence was also limited. Although our sample size was large, total sample size may not be the overriding driver of statistical power to detect interactions when the sample is parsed unevenly. Maternal depression and violence exposure are, statistically speaking, relatively uncommon events. Therefore, despite a large initial sample size, we actually faced small cell sizes when modeling inter-

actions involving variables with uneven distributions. Largely on the basis of trends among the outcome measures presented and biological plausibility, we argue that an interaction between maternal depression and violence is likely; however, this will remain suspect until future confirmation.

Because our study was cross-sectional, we cannot assume causality or comment on the longitudinal effects of maternal depression and violence on child cognition or behavior. As in any observational study, the possibility of unmeasured confounding exists. Maternal health and child health represent likely sources of such biases in our study. Lastly, because of sample size limitations, we were unable to explore fully subanalyses among non-white races. Therefore, data on racial differences should be considered preliminary.

With these limitations in mind, we argue that our study has important research and clinical implications. First, interventions aiming to ameliorate the adverse effects of maternal depression on children should consider the influence of violence exposure and should incorporate specific therapeutic strategies to address it. Second, pediatric providers should be aware that children whose mothers are both depressed and exposed to violence represent a group at particularly high risk for cognitive and behavioral problems. Because violence exposure commonly causes trauma, stress, or frank post-traumatic stress disorder in children and adults, the presence of these clinical symptoms and the effects of specific interventions to treat them need to be studied. The present study is not meant to be a definitive analysis of the potentially interactive effects of violence and maternal depression on childhood outcomes. Rather, it indicates that, from the perspective of child outcomes, considering maternal depression without considering violence potentially means ignoring a significant part of the problem.

ACKNOWLEDGMENTS

We thank Howard Bauchner, MD, and Kari Hironaka, MD, MPH, for thoughtful review of the manuscript. We thank Terry Keane, PhD, for insight into the relationship between depression and violence exposure. We thank the Boston University School of Medicine ECLS-K Workgroup for input into our study. We thank the Weaver Family Foundation, the Harris Foundation, and the Maternal and Child Health Bureau for support of this project.

Dr Silverstein had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

REFERENCES

1. Kim-Cohen J, Moffitt TE, Taylor A, Pawlby SJ, Caspi A. Maternal depression and children's antisocial behavior: nature and nurture effects. *Arch Gen Psychiatry*. 2005;62:173-181

2. Herwig JE, Wirtz M, Bengel J. Depression, partnership, social support, and parenting: interaction of maternal factors with behavioral problems of the child. *J Affect Disord.* 2004;80:199–208
3. Beardslee WR, Keller MB, Lavori PW, Klerman GK, Dorer DJ, Samuelson H. Psychiatric disorder in adolescent offspring of parents with affective disorder in a non-referred sample. *J Affect Disord.* 1988;15:313–322
4. Grigoriu-Serbanescu M, Christodorescu D, Magureanu S, et al. Adolescent offspring of endogenous unipolar depressive parents and of normal parents. *J Affect Disord.* 1991;21:185–198
5. Hurt H, Malmud E, Brodsky NL, Giannetta J. Exposure to violence: psychological and academic correlates in child witnesses. *Arch Pediatr Adolesc Med.* 2001;155:1351–1356
6. Holden GW, Ritchie KL. Linking extreme marital discord, child rearing, and child behavior problems: evidence from battered women. *Child Dev.* 1991;62:311–327
7. Wolfe DA, Jaffe P, Wilson SK, Zak L. Children of battered women: the relation of child behavior to family violence and maternal stress. *J Consult Clin Psychol.* 1985;53:657–665
8. Groves BM. Mental health services for children who witness domestic violence. *Future Child.* 1999;9:122–132
9. Groves BM, Zuckerman B, Marans S, Cohen DJ. Silent victims: children who witness violence. *JAMA.* 1993;269:262–264
10. Brown JR, Hill HM, Lambert SF. Traumatic stress symptoms in women exposed to community and partner violence. *J Interpers Violence.* 2005;20:1478–1494
11. Kemp A, Green B. Incidence and correlates of posttraumatic stress disorder in battered women. *J Interpers Violence.* 1995;10:43–56
12. Saunders DG. Posttraumatic stress symptom profiles of battered women: a comparison of survivors in two settings. *Violence Vict.* 1994;9:31–44
13. Berton MW, Stabb SD. Exposure to violence and post-traumatic stress disorder in urban adolescents. *Adolescence.* 1996;31:489–498
14. Nixon RD, Resick PA, Nishith P. An exploration of comorbid depression among female victims of intimate partner violence with posttraumatic stress disorder. *J Affect Disord.* 2004;82:315–320
15. Stein MB, Kennedy C. Major depressive and post-traumatic stress disorder comorbidity in female victims of intimate partner violence. *J Affect Disord.* 2001;66:133–138
16. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders.* 4th ed. Arlington, VA: American Psychiatric Association; 1994
17. Hegarty K, Gunn J, Chondros P, Small R. Association between depression and abuse by partners of women attending general practice: descriptive, cross-sectional survey. *BMJ.* 2004;328:621–624
18. Nicolaidis C, Curry M, McFarland B, Gerrity M. Violence, mental health, and physical symptoms in an academic internal medicine practice. *J Gen Intern Med.* 2004;19:819–827
19. Romito P, Molzan Turan J, De Marchi M. The impact of current and past interpersonal violence on women's mental health. *Soc Sci Med.* 2005;60:1717–1727
20. Shalev AY, Freedman S, Peri T, et al. Prospective study of posttraumatic stress disorder and depression following trauma. *Am J Psychiatry.* 1998;155:630–637
21. Hegel MT, Unutzer J, Tang L, et al. Impact of comorbid panic and posttraumatic stress disorder on outcomes of collaborative care for late-life depression in primary care. *Am J Geriatr Psychiatry.* 2005;13:48–58
22. Holtzheimer PE III, Russo J, Zatzick D. The impact of comorbid posttraumatic stress disorder on short-term clinical outcome in hospitalized patients with depression. *Am J Psychiatry.* 2005;162:970–976
23. Matza LS, Revicki DA, Davidson JR, Stewart JW. Depression with atypical features in the National Comorbidity Survey: classification, description, and consequences. *Arch Gen Psychiatry.* 2003;60:817–826
24. Levitan RD, Parikh SV, Lesage AD, et al. Major depression in individuals with a history of childhood physical or sexual abuse: relationship to neurovegetative features, mania, and gender. *Am J Psychiatry.* 1998;155:1746–1752
25. Gladstone GL, Parker GB, Mitchell PB, Malhi GS, Wilhelm K, Austin MP. Implications of childhood trauma for depressed women: an analysis of pathways from childhood sexual abuse to deliberate self-harm and revictimization. *Am J Psychiatry.* 2004;161:1417–1425
26. Oquendo M, Brent DA, Birmaher B, et al. Posttraumatic stress disorder comorbid with major depression: factors mediating the association with suicidal behavior. *Am J Psychiatry.* 2005;162:560–566
27. Rayburn NR, Wenzel SL, Elliott MN, Hambarsoomians K, Marshall GN, Tucker JS. Trauma, depression, coping, and mental health service seeking among impoverished women. *J Consult Clin Psychol.* 2005;73:667–677
28. Vythilingam M, Heim C, Newport J, et al. Childhood trauma associated with smaller hippocampal volume in women with major depression. *Am J Psychiatry.* 2002;159:2072–2080
29. Verduyn C, Barrowclough C, Roberts J, Tarrier T, Harrington R. Maternal depression and child behaviour problems: randomised placebo-controlled trial of a cognitive-behavioural group intervention. *Br J Psychiatry.* 2003;183:342–348
30. National Center for Education Statistics. *Early Childhood Longitudinal Survey, Kindergarten Class of 1998–1999.* Washington, DC: US Department of Education; 2004
31. Radloff L. The CES-D Scale: a self-report depression scale for research in the general population. *Appl Psychol Measure.* 1977;1:385–401
32. National Center for Education Statistics. *User's Manual for the ECLS-B Nine-Month Public-Use Data File.* Washington, DC: US Department of Education; 2005
33. Blazer DG, Kessler RC, McGonagle KA, Swartz MS. The prevalence and distribution of major depression in a national community sample: the National Comorbidity Survey. *Am J Psychiatry.* 1994;151:979–986
34. Kessler RC, Berglund P, Demler O, et al. The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). *JAMA.* 2003;289:3095–3105
35. Kessler RC, McGonagle KA, Zhao S, et al. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: results from the National Comorbidity Survey. *Arch Gen Psychiatry.* 1994;51:8–19
36. Gresham F, Elliot S, eds. *Social Skills Rating System.* Circle Pines, MN: American Guidance Services; 1990
37. Rock DA, Pollack JM. *Early Childhood Longitudinal Survey, Kindergarten Class of 1998–99: Psychometric Report for Kindergarten Through First Grade.* Washington, DC: US Department of Education; 2002
38. Datar A, Sturm R. Childhood overweight and parent- and teacher-reported behavior problems: evidence from a prospective study of kindergartners. *Arch Pediatr Adolesc Med.* 2004;158:804–810
39. Jaffe P, Wolfe D, Wilson SK, Zak L. Family violence and child adjustment: a comparative analysis of girls' and boys' behavioral symptoms. *Am J Psychiatry.* 1986;143:74–77
40. Fullilove MT. Abandoning "race" as a variable in public health research: an idea whose time has come [comment]. *Am J Public Health.* 1998;88:1297–1298
41. Rivara F, Finberg L. Use of the terms race and ethnicity. *Arch Pediatr Adolesc Med.* 2001;155:119

42. Jones CP. "Race," racism, and the practice of epidemiology [invited commentary]. *Am J Epidemiol*. 2001;154:299–304
43. Abbott J, Johnson R, Koziol-McLain J, Lowenstein SR. Domestic violence against women: incidence and prevalence in an emergency department population. *JAMA*. 1995;273:1763–1767
44. McCauley J, Kern DE, Kolodner K, et al. The "battering syndrome": prevalence and clinical characteristics of domestic violence in primary care internal medicine practices. *Ann Intern Med*. 1995;123:737–746
45. Dearwater SR, Coben JH, Campbell JC, et al. Prevalence of intimate partner abuse in women treated at community hospital emergency departments. *JAMA*. 1998;280:433–438
46. Needleman HL, Schell A, Bellinger D, Leviton A, Allred EN. The long-term effects of exposure to low doses of lead in childhood: an 11-year follow-up report. *N Engl J Med*. 1990;322:83–88
47. Needleman HL, Gunnoe C, Leviton, et al. Deficits in psychologic and classroom performance of children with elevated dentine lead levels. *N Engl J Med*. 1979;300:689–695
48. Fulton M, Raab G, Thomson G, Laxen D, Hunter R, Hepburn W. Influence of blood lead on the ability and attainment of children in Edinburgh. *Lancet*. 1987;1:1221–1226
49. Grunau RE, Whitfield MF, Fay TB. Psychosocial and academic characteristics of extremely low birth weight (≤ 800 g) adolescents who are free of major impairment compared with term-born control subjects. *Pediatrics*. 2004;114(6). Available at: www.pediatrics.org/cgi/content/full/114/6/e725
50. Saigal S, Hoult LA, Streiner DL, Stoskopf BL, Rosenbaum PL. School difficulties at adolescence in a regional cohort of children who were extremely low birth weight. *Pediatrics*. 2000;105:325–331
51. Anderson P, Doyle LW. Neurobehavioral outcomes of school-age children born extremely low birth weight or very preterm in the 1990s. *JAMA*. 2003;289:3264–3272

Maternal Depression and Violence Exposure: Double Jeopardy for Child School Functioning

Michael Silverstein, Marilyn Augustyn, Howard Cabral and Barry Zuckerman

Pediatrics 2006;118;792-800

DOI: 10.1542/peds.2005-1841

This information is current as of December 7, 2006

Updated Information & Services	including high-resolution figures, can be found at: http://www.pediatrics.org/cgi/content/full/118/3/e792
References	This article cites 43 articles, 27 of which you can access for free at: http://www.pediatrics.org/cgi/content/full/118/3/e792#BIBL
Subspecialty Collections	This article, along with others on similar topics, appears in the following collection(s): Office Practice http://www.pediatrics.org/cgi/collection/office_practice
Permissions & Licensing	Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at: http://www.pediatrics.org/misc/Permissions.shtml
Reprints	Information about ordering reprints can be found online: http://www.pediatrics.org/misc/reprints.shtml

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

